

3.0 IMPACTS ON PUBLIC HEALTH AND THE ENVIRONMENT

3.1 Human Health Effects

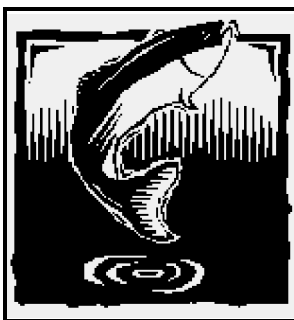
Mercury exposure in humans can lead to a variety of negative health effects including neurotoxicity, kidney toxicity, gastrointestinal toxicity, genetic toxicity, cardiovascular toxicity, dermal toxicity, developmental toxicity and even death. The severity of these effects depends on the route and duration of exposure, the delivered dose, the chemical form of the mercury (e.g., elemental versus methyl mercury), the physical parameters of the environment (e.g., temperature, wind direction, etc.), exposure to other chemicals and stressors, and the age, gender and physical condition of the individuals exposed.

Methyl mercury is transported across the blood-brain barrier and, in pregnant women, across the placenta into the fetus. In young children and fetuses, methyl mercury inhibits the normal development of the nervous system and these effects may occur even at low exposure levels. The extent of the damage frequently is not apparent until later in the developmental process when the child's motor and verbal skills are found to be delayed or abnormal. Developmental effects have been found in children who were exposed in utero, even though their mothers did not experience any symptoms of adult toxicity.

Food, primarily fish, is the most significant source of methyl mercury exposure for the general population. Other potential exposure pathways exist, such as breathing vapors from accidental mercury spills or breathing mercury-containing vapors from incinerators and fossil fuel plants, but these are much less likely to affect the general population. In addition, some mercury exposure to individuals may occur from dental amalgam, but the effects of this are not well documented.

3.1.1 Fish Consumption Advisories

Public health experts, scientists, and environmental experts view mercury contamination as a serious health and environmental issue. Mercury contamination in freshwater fish is widespread and significant enough to warrant fish consumption advisories in New Hampshire and 39 other states (see **Figure 4**). Although some states do not currently have mercury advisories, this may be attributable more to lack of monitoring data than low mercury concentrations (*Northeast States/Eastern Canadian Provinces Mercury Study, 1998*).

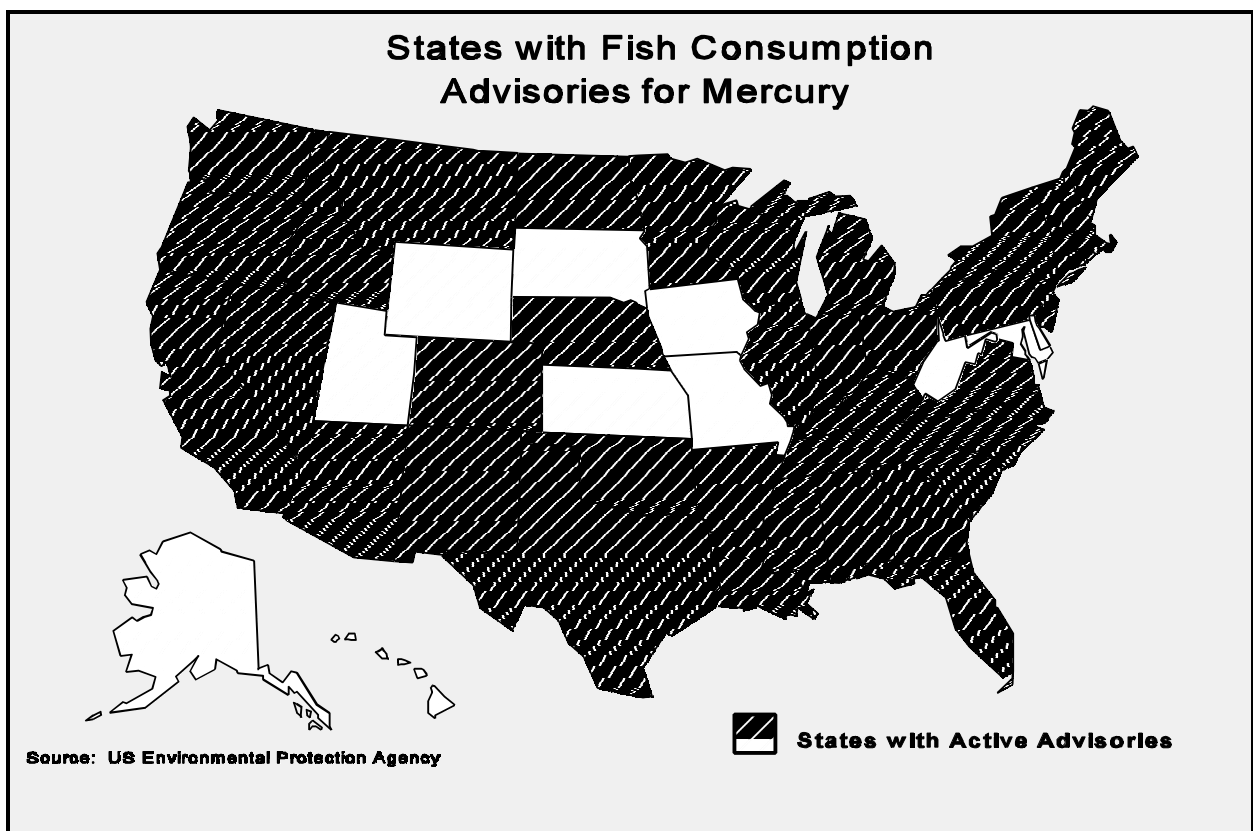


New Hampshire's statewide fish consumption advisory, issued by the New Hampshire Department of Health and Human Services, applies to all freshwater fish species collected from all inland waters. New Hampshire's advisory recommends that women of childbearing age and young children limit their consumption of freshwater fish to no more than one meal per month. All other people are encouraged to limit their freshwater fish consumption to no more than four meals per month. The advisory further encourages the public to eat smaller, younger fish, which contain less mercury. The National Marine Fisheries Service and the US Food and Drug Administration (USFDA)

evaluate and regulate the content of mercury in marine fisheries. The USFDA has established an action level of 1 part per million (ppm) for saltwater and freshwater species. Several studies of marine fisheries have demonstrated that mercury concentrations do not appear to be increasing in those species sampled, however some species such as tuna and swordfish, do contain mercury levels of concern, and pregnant women and young children are urged to consume these species in moderation.

Based on over 400 samples of 20 fish species collected from inland waters throughout the State, mercury levels in New Hampshire freshwater fish range from 0.02 to 2.26 parts per million (ppm). Eight percent of the fish sampled had mercury concentrations exceeding the action level established by the USFDA. The amount of mercury present in fish is related to a number of variables, including water and watershed characteristics, fish species, and fish size (or age). Mercury concentrations tend to be higher in larger fish and in fish from tea-colored and relatively acidic waters. Concentrations exceeding 1 ppm were found in four species of fish: largemouth bass, small mouth bass, pickerel, and yellow perch.

Figure 4



3.2 Environmental Effects

Methyl mercury exposure also adversely affects plants, fish, mammals and birds. Effects on plants include decreased chlorophyll production, inhibited growth, root and leaf damage, accelerated aging, and death. Reproductive problems are the primary concern for birds (e.g. loons, eagles, herons and kingfishers) suffering from mercury poisoning. These effects can occur with dietary concentrations of mercury that are well below those which cause overt toxicity. Recent data collected by the Loon Preservation Committee (LPC) in Moultonborough, New Hampshire showed that among 95 abandoned loon eggs, 66% had mercury levels at or above the “lowest observed effects” level of 0.5 ppm, or at levels that may cause reproductive impairment of > 1.0 ppm. Furthermore, 4.2% had mercury levels believed to be sufficiently high to prevent hatching (*Loon Preservation Committee, 1998*). Additional mercury effects in birds include liver damage, kidney damage, and neurobehavioral effects. These same effects may be found in other wildlife that prey on mercury contaminated fish such as snapping turtles, otters and mink (*USEPA, 1997*).



Effects on wildlife are greatly determined by such factors as feeding habits and placement in the food chain. Since carnivores accumulate more mercury than omnivores, those species at the top of the aquatic food chain are at greater risk for methyl mercury exposure. Several recent studies on bird species in the Northeast have documented elevated mercury levels in bald eagles, common loons and osprey. In the Atlantic Region of Canada, mean mercury concentrations close to 5 ppm have been reported in the blood of some adult loons. Similarly, elevated levels of mercury have been found in fish-eating mammals such as mink and otter (*Northeast States/Eastern Canadian Provinces Mercury Study, 1998*).

Data collected by the Audubon Society of New Hampshire (ASNH) in 1997 indicates that fish-consuming wildlife in the state -- such as loons, eagles and otters -- are also at risk. For example, mercury levels in the blood of New Hampshire loons averaged 1.85 ppm in females and 3.45 ppm in males in 1997 (*ASNH, 1997*). Of significant concern, individual loons caught again in 1998 show additional accumulation of 8-12% over 1997 in blood mercury levels (Evers, et. al., 1998). Continued study is clearly warranted in order to further assess the adverse effects of methyl mercury exposure on plants and wildlife.